

THE FRAGILITY OF THE COPPER DEMAND FOR THE CHILEAN ECONOMY.

Is the increasing demand of China and India of Peruvian copper a threat for Chile?

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für Bildung
und Forschung

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1. COFORCE – model approach

- ⇒ Model philosophy
- ⇒ Scheme of COFORCE

COFORCE – model approach

- ▶ Chilean model COFORCE (**COpper Forecasting ChilE**) is based on the modelling philosophy of the INFORUM group
- ▶ dynamic macro-econometric input-output-model
- ▶ Bottom-up-approach
- ▶ Inter-industry relation between individual industrial sectors
- ▶ Equations are solved iteratively, no equilibrium condition has to be met
- ▶ Estimation of all parameters, besides a few exogenous variables and stock data

COFORCE – model approach

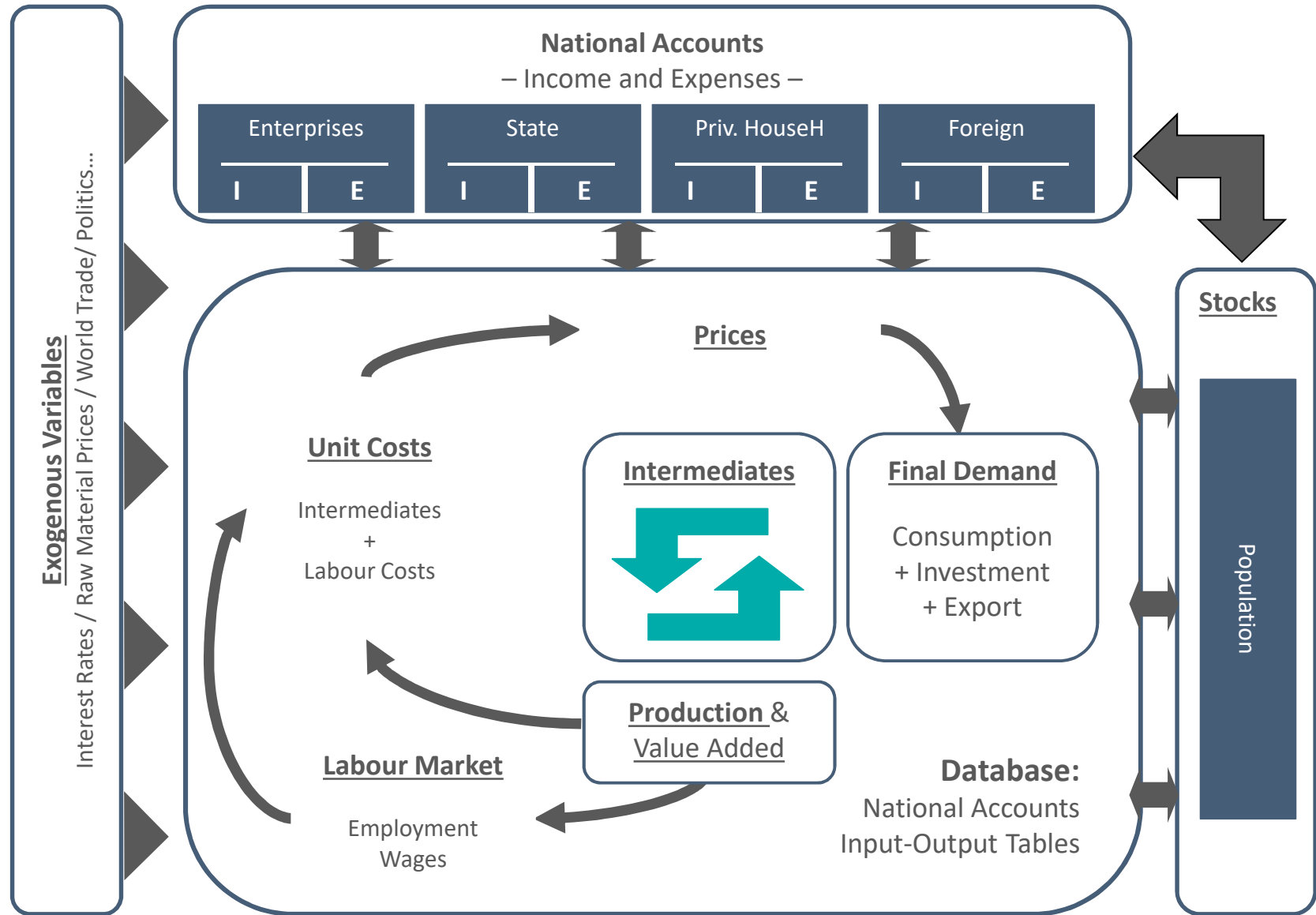
▶ Data

- National Accounts, IO-Tables, Chilean National Statistical Institute INE, Chilean Central Bank
- Raw material & commodity prices: IMF, FAO, IEA
- Historical data: 1996 - 2013
- Projection period: 2014-2035

▶ Classification of sectors

- ⇒ differentiation in 73 sectors (acc. to IO)
- ⇒ labour market data in 32 sectors

COFORCE – model scheme



COFORCE

▶ General estimation approach

- ⇒ Estimation of macro price (no price information given by sectors)
- ⇒ Estimation of nominal/real variable by sectors
- ⇒ Definition equation for nominal/real variable by sectors, i.e. value added & unit costs

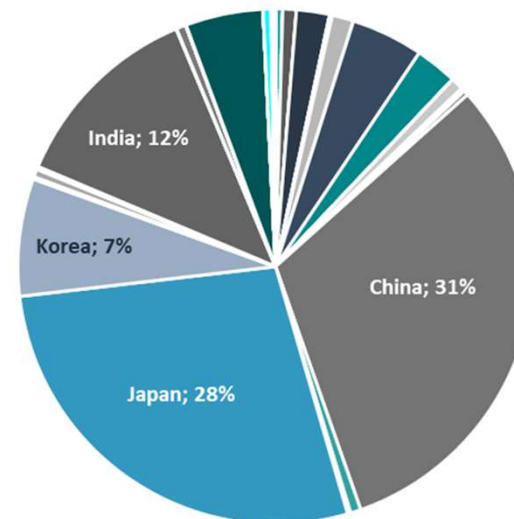
▶ Start: Estimation of final demand components

- ⇒ production via Leontief production function
- ⇒ labour market: wages and employment
- ⇒ prices via unit cost approach

2. The Chilean copper market

Chilean copper market

- ▶ Export-oriented market: 99,6% exports
- ▶ 45% of Chilean exports base on copper
- ▶ Copper price forecast define governmental expenditures
- ▶ Main trading partners:
 - China demands most
 - Indias copper imports from Chile grow faster than China`s in forecast
- ▶ High production prises caused loss in productivity (2002 – 2014) => industry doesn`t gain same productivity level until in long run



Source: TINFORGE, own calculation

3. Scenario: Export demand shift towards Peru

- ⇒ Scenario: Asian countries demand Peruvian copper
- ⇒ Scenario results

Scenario: Asian countries demand Peruvian copper

► IDEA:

- ⇒ Peru`s copper reserves and favourable investment conditions: copper production grew 200% in last 15 years;
- ⇒ output of new mine **Las Bambas** in 2017 450 tsd. T;
 - $\hat{=}$ 18% of Peruvian production or 8% Chilean production
- ⇒ Growing population and urbanization => **growing sustainability awareness in Asian countries => favours copper demand**
- ⇒ Growing copper demand of China & India is mainly satisfied by the output of Las Bambas

► Scenario: China and India import less copper from Chile:

- 5% p.a. by each country
- copper demand still rises, but former growth path weakens
- demand shift lasts five years (2018 – 2022)

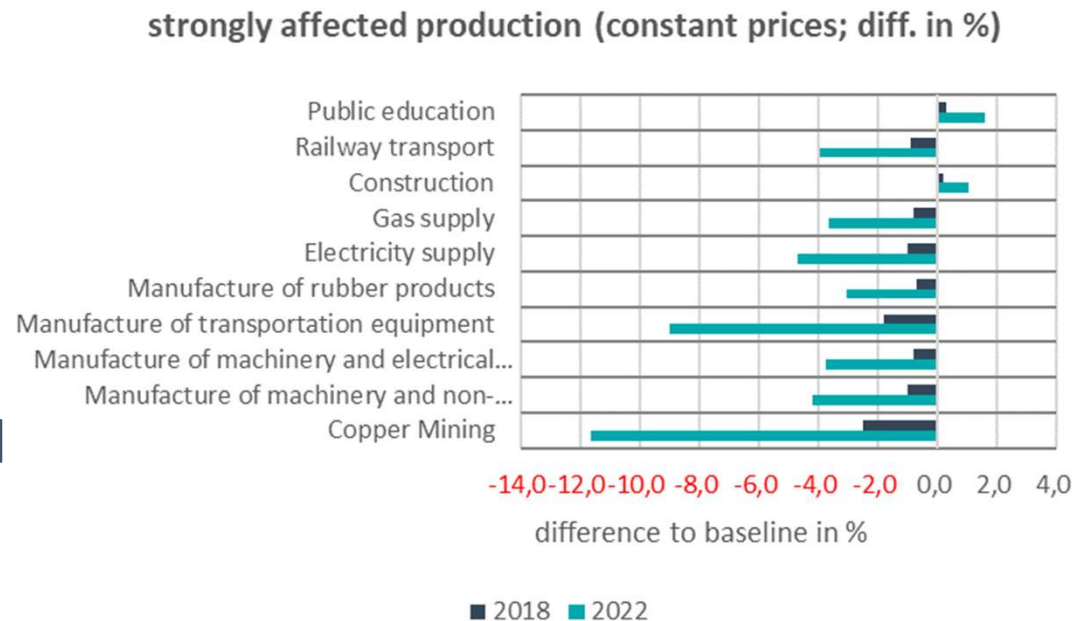
	2017	2018	2019	2020	2021	2022
BASELINE copper export, 2017=100	100	103,0	106,1	109,3	112,7	116,2
SCENARIO copper export, 2017=100	100	100,5	101,0	101,6	102,2	102,9

Scenario results: Production & Employment

- ▶ Production decline is of **0.5%** (2018) and of **2.4%** (2022)
- ▶ Effect on **sectoral level** is mainly negative
 - ⇒ **Copper industry: -11.6%** (2022)
 - ⇒ Industries strongly linked to copper production decrease ~ 4 – 9%

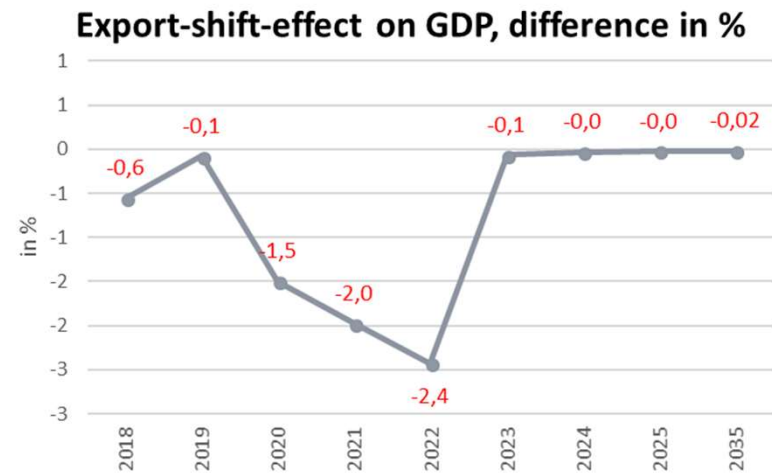
▶ Employment

- real production (+)
- real wage wage/ppil (+)
- ▶ 28 tsd persons are less employed (-0.3%); 2022
- ▶ Reaction on sectoral level equivalent to production



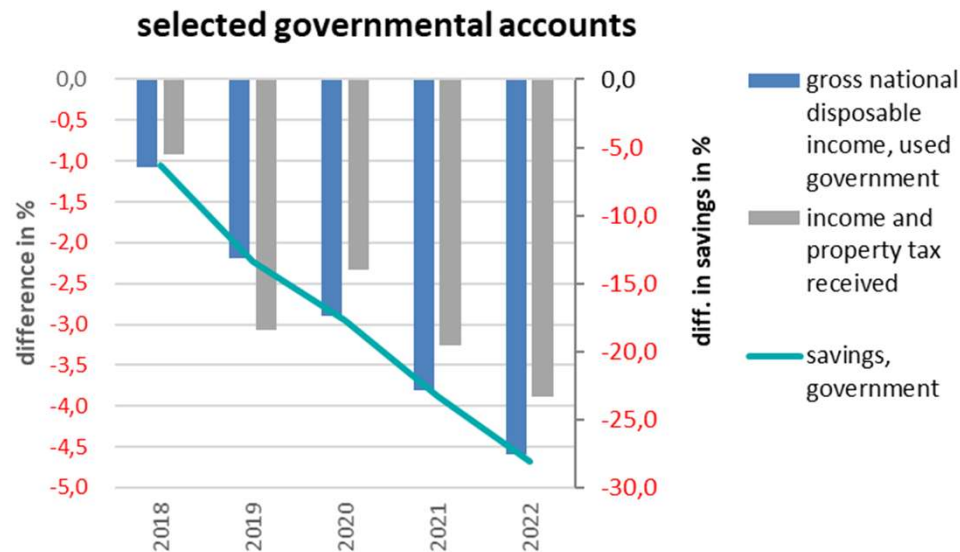
Scenario results: GDP

- ▶ GDP-decline: 0.6% -> 2.4%
- ▶ **Exports & private consumption** cause > 90% of GDP-effect
- ▶ employment affects consumption possibilities of priv. households
- ▶ **GDP doesn't recover completely** after the export demand shift ends in 2023 but the rel. diff. to baseline is lower than 0.1%
- **High share of copper on all Chilean exports demonstrates that GDP is not only influenced by demand-shifts on copper-exports but also by private consumption**



Scenario results: Governmental income

- ▶ Disposable income falls 1.1% (2018) up to 4.6% (2022)
- ▶ Third part of disposable income effect is caused by income tax-reduction (fallen wage)
- ▶ Saving-possibilities fall up to 28%
- **Possibilities to realize intended policy measures by the government are limited with ~5% less disposable income!**



4. Conclusion and outlook

- ⇒ How vulnerable is Chile concerning their copper? What Chile should think about?
- ⇒ Further development of COFORCE

Conclusion

- ▶ Global copper demand is rising and the development in growing countries promises to enforce it; Chile will participate but other countries, especially the neighbour in the north has a dynamic production and is inclined to boost the investments
- ▶ Chile`s refinery capacities favours its site but China is willing to import the ore and to refine it at home
- ▶ The sceanario shows, that **reduced copper-exports induce a production-fall** in mainly all Chilean industries => employment and wages fall => GDP declines
- ▶ **Chile`s economy shows a vulnerability** to a demand-shift on copper
- ▶ Recovery of Chilean economy is fast, even if GDP-development doesn`t return completely to former growth path
- ▶ Most affected industries should intensify their efforts in the diversification of their clients or suppliers
- ▶ The productivity of the copper industry isn`t optimum

Outlook

- ▶ **More detailed data would favour results:** data base and estimations, i.e. original price data on sectoral level, employment on 73-sector-level, qualification data
- ▶ Next step is **regionalization of COFORCE**; one idea is to analyze the presumption that the value added of the copper industry doesn't remain in the copper regions but flows to Santiago or to the investment countries

Thank you for your attention.



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